

CLAIMS

1. A high-speed driving method of a pressure cylinder including:
a moving step of moving a piston to a target position by supplying
5 and discharging compressed air to and from a head-side pressure
chamber and a rod-side pressure chamber on opposite sides of
the piston of the pressure cylinder by a head-side servo valve
and a rod-side servo valve individually connected to the pressure
chambers; a clamping step of bringing a pressure member at a
10 tip end of a piston rod coupled to the piston in contact with
a workpiece; and a pressing force applying step of pressing the
workpiece with the pressure member,

wherein, in the moving step, which of a head-side end and
a rod-side end of the pressure cylinder the target position is
15 closer is sensed, the pressure chamber on a side of the end far
from the target position is pressure-controlled so that a
pressure of the pressure chamber is maintained at a set value
by the servo valve connected to the pressure chamber, and the
pressure chamber on a side of the end close to the target position
20 is positioning-controlled so as to stop the piston in the target
position by controlling coming in and out of the compressed air
by the servo valve connected to the pressure chamber,

in the clamping step, control for allowing the pressure
member to touch the workpiece softly by making an exhaust opening
25 degree of the rod-side servo valve constant is carried out when
a distance between the pressure member and the workpiece has
become equal to or shorter than a certain distance, and

in the pressing force applying step, both servo valves are controlled so that the pressure of the head-side pressure chamber becomes higher than the pressure of the rod-side pressure chamber by a set value.

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2. A method according to claim 1, wherein, in the pressing force applying step, an exhaust side of the rod-side servo valve is fully opened and simultaneously the head-side servo valve is controlled so that a pressure difference between both pressure 10 chambers becomes equal to the set value.

3. A method according to claim 1, wherein, in the pressing force applying step, an air supply side of the head-side servo valve is fully opened or brought into a certain high-pressure 15 outputting state and simultaneously the rod-side servo valve is controlled so that a pressure difference between both pressure chambers becomes equal to the set value.

4. A method according to anyone of claims 1 to 3, wherein criteria 20 by which to judge that the pressure member has come in contact with the workpiece are if an internal pressure of the rod-side pressure chamber is lower than an internal pressure of the head-side pressure chamber and if the pressure member is in a sufficiently close position to the workpiece.

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5. A method according to claim 4, wherein the criteria includes if a time which has passed since the piston started moving exceeds

a set time.

6. A high-speed driving system of a pressure cylinder comprising: a pressure cylinder for pressurizing a workpiece
5 with a pressing member at a tip end of a piston rod; a head-side servo valve and a rod-side servo valve which are individually connected to a head-side pressure chamber and a rod-side pressure chamber on opposite sides of a piston coupled to the piston rod and which supply and discharge compressed air to and from the
10 pressure chambers; pressure sensors respectively for detecting pressures of both pressure chambers; a position sensor for detecting a position of the piston; and a controller for controlling both servo valves based on outputs from the pressure sensors and the position sensor,

15 wherein the controller has a movement controlling function for moving the piston to a target position, a clamping controlling function for bringing the pressure member at the tip end of the piston rod in contact with the workpiece, and a pressing force application controlling function for pressing the workpiece with
20 the pressure member,

in the movement control of the piston, which of a head-side end and a rod-side end of the pressure cylinder the target position is closer is sensed, the pressure chamber on a side of the end far from the target position is pressure-controlled so that a
25 pressure of the pressure chamber is maintained at a set value by the servo valve connected to the pressure chamber, and the pressure chamber on a side of the end close to the target position

is positioning-controlled so as to stop the piston in the target position by controlling coming in and out of the compressed air by the servo valve connected to the pressure chamber,

in the clamping control, control for allowing the pressure member to touch the workpiece softly by making an exhaust opening degree of the rod-side servo valve constant is carried out when a distance between the pressure member and the workpiece has become equal to or shorter than a certain distance, and

in the pressing force application control, both servo valves are controlled so that the pressure of the head-side pressure chamber becomes higher than the pressure of the rod-side pressure chamber by a set value.

7. A system according to claim 6, wherein, in the pressing force application control, the controller controls the rod-side servo valve so that an exhaust side is fully opened and simultaneously controls the head-side servo valve so that a pressure difference between both pressure chambers becomes equal to the set value.

8. A system according to claim 6, wherein, in the pressing force application control, the controller controls the head-side servo valve so that an air supply side is fully opened or brought into a certain high-pressure outputting state and simultaneously controls the rod-side servo valve so that a pressure difference between both pressure chambers becomes equal to the set value.